

**MEETING PACKAGE - JANUARY 17, 2002  
TELECONFERENCE**

**Environmental Technology Verification (ETV)**

**Drinking Water Systems (DWS) Center**

## **SC Agenda – January 17, 2002 Telephone Conference Call**

### ***Status Report***

Verification Testing – completed reports, tests in process.

Protocol and Technology Specific Test Plan (TSTP) – completed and revisions in process

1. Harmonization of ETV Filtration Protocol and TSTP with LT2 ESWTR Guidance
  - a. Microsphere Surrogate Decision
  - b. Teleconference Minutes on Draft LT2 ESWTR Filtration
2. Harmonization of ETV Ultraviolet (UV) Radiation Protocol & TSTP with LT2 ESWTR Guidance

Progress since June 2001 meeting

Other Specific Issues:

1. Mandatory calculation of O&M efficiencies for technologies going through ETV testing.
2. Coagulation/Filtration technologies for Arsenic Removal: testing the water quality of water in reaction tanks and prior to media filters to verify the actual Iron coagulant feed concentration.
3. Reverse Osmosis (RO) technologies for Arsenic Removal: The possible use of an As (III) spike to address limitations of the membranes.

### ***Plans and Action Items***

Highest priority to small system arsenic reduction technologies

Priority for harmonization of the ETV UV & Filtration Protocols with LT2

Communications electronically versus paper

More cost sharing – a fee for services schedule

## ***1. Status Report***

### **1.1 Verification Testing**

There are now 25 tests and reports completed. A complete list is on the EPA and NSF web sites (<http://www.epa.gov/etv/verifrp.htm#water> and [http://www.nsf.org/etv/dws/pdf/List\\_12-5-01.pdf](http://www.nsf.org/etv/dws/pdf/List_12-5-01.pdf)) and also attached as a file to this Status Report as Attachment A. Recent additions since the June 2001 stakeholder meeting include the following ten reports:

- 1 **Kinetico Macrolite® Pressure Filtration Backwashable Depth System** - Reduction of *Giardia* and *Cryptosporidium*, June 2001
- 2 **Kinetico Coagulation/Filtration System** - Reduction of *Giardia* and *Cryptosporidium*, August 2001
- 3 **Kinetico Coagulation/Filtration System** - Reduction of Arsenic, September 2001
- 4 **KOCH TFC-ULP4 Reverse Osmosis Element Module** - Reduction of Arsenic, August 2001
- 5 **Lapoint Industries Aqua-Rite Potable Water Filtration System** - Reduction of *Giardia*- and *Cryptosporidium*-sized particles, September 2001
- 6 **Osmonics Ozone Disinfection System (Model PS-150)** - Inactivation of *Cryptosporidium parvum* by Infectivity Studies and Determination of CT Values as a Surrogate for *Giardia lamblia* and Virus Inactivation, December 2001
- 7 **OXI Company, Inc. OXI-2B Onsite Mixed Oxidant Generator** - Production of chlorine and Inactivation of *Pseudomonas aeruginosa*, June 2001
- 8 **PentaPure, Inc. PentaPure® H-3000-I Mobile Water Purification Station** - Inactivation of *E. coli* and MS2 virus, August 2001
- 9 **Rosedale Products Inc. Cartridge Filter** - Reduction of *Giardia*- and *Cryptosporidium*-sized particles, September 2001
- 10 **Zenon ZeeWeed™ Ultrafiltration System** - Reduction of *Giardia*, *Cryptosporidium*, and MS2 virus, June 2001

### **1.2 Protocols and TSTP**

The pilot phase completed nine protocols and 24 technology specific test plans. Two TSTPs will be updated soon: the EPA/NSF ETV Equipment Verification Testing Plan for Removal of Synthetic Organic Chemicals (SOCs) by Adsorptive Media and the EPA/NSF ETV Equipment Verification Testing Plan for Removal of Volatile Organic Chemicals (VOCs) by Adsorptive Media.

#### ***1.2.1 Status of ballots – Members not responding to recent balloting.***

##### **1.2.1.1 Steering Committee (Sixteen people total): Ballot on protocol changes agreed to in the June Meeting.**

Seven ballots received from:

James Bell  
Jerry Biberstine  
Joseph Jacangelo  
Robert Mann

Victor Wilford  
Gary Logsdon  
Kevin Brown

Nine ballots not received from:

Steve Clark  
John Dyson  
Joe Harrison  
Jerry Lane  
Glen Latimer

David Pearson  
Peter Shanaghan  
Ed Urheim  
Steve Via

1.2.1.2 Technical Subcommittee (Nine people total): Ballot results on biologically based disinfection by-product removal technology and electro-coagulation technology.

**Clear Value – Coagulation with Microbiological Augmentation of Filtration**

Four ballots received from:

Jerry Biberstine  
Robert Mann

Edward Urheim  
Victor Wilford

From these four responses, it was unanimous that the Center should not spend its resources to develop a protocol for this technology. If any of the remaining five technical committee members wish to recommend the contrary, please inform NSF immediately:

Five ballots not received from:

Kevin Brown  
Steve Clark  
Jerry Lane

Peter Shanaghan  
Steve Via

**New China, LLC – Electrocoagulation for Removal of Inorganic Constituents and Inactivation of Microorganisms**

Four ballots received from:

Jerry Biberstine  
Kevin Brown

Robert Mann  
Victor Wilford

The four responses have been inconclusive in the recommendation of whether the Center should spend its resources to develop a protocol for this technology. *The Center needs responses from the remaining technical committee members to reach decision on this request:*

Five ballots needed from:

Steve Clark  
Jerry Lane  
Peter Shanaghan

Ed Urheim  
Steve Via

*1.2.2 Harmonization of ETV Filtration Protocol & TSTP with LT2 ESWTR Guidance*

*1.2.2.1 Microsphere Surrogate Decision*

An FTO requested the ETV DWS Center to use microspheres for ETV testing of a UF/MF. The request resulted from the prohibition of the use of fixed or otherwise killed *Cryptosporidium*, by the water utility and which is a growing trend since September 11

attacks and the anthrax mailings. The DWS Center requested a call with the EPA OGWDW to discuss an alternative to the use of *Cryptosporidium* oocyst seeding and the result was a proposal to use a conservative size range of microspheres for challenging UF/MF membranes. The microspheres proposed had the following characteristics: sized 99.9% <2.5 micron, fluorescent, and surface charge <0.2 micro-equivalents per gram. The summary of the conference call is attached as Attachment B.

#### 1.2.2.2 Teleconference Minutes on Draft LT2 ESWTR Filtration

The ETV DWS Center held three conference call(s) with the EPA OGWDW on harmonizing the filtration TSTPs (membrane and bag/cartridge) with those under development by the EPA's OGWDW. Several stakeholders provided comments. Summaries of these conference calls can be found on the above-mentioned websites.

The EPA Office of ground Water and Drinking Water is making progress on guidance for membrane filtration and will share it with the ETV stakeholders when it is in a form suitable for review. Also, there is a pre-proposal draft of the LT2ESWTR on EPA's website: [http://www.epa.gov/safewater/lt2/lt2\\_preamble.pdf](http://www.epa.gov/safewater/lt2/lt2_preamble.pdf) or see the "pdf" file attached to your email that contained this meeting packet.

#### 1.2.3 *Harmonization of ETV UV Protocol & TSTP with LT2 ESWTR Guidance*

There are several documents related to UV evaluation and testing for use in drinking water and each is unique and different from the other:

- The ETV Drinking Water Systems (DWS) Center "Protocol for Inactivation of Microbiological Contaminants: Test Plan for Ultraviolet Radiation Technologies".
- The ETV Source Water Protection (SWP) "Draft – Generic Verification Protocol for Secondary Effluent and Water Reuse Disinfection Applications".
- The AWWARF/NWRI "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse".
- The Appendix B in the Preliminary Draft of the EPA's UV Guidance Manual.

This proliferation of documents has created a considerable amount of consternation within the UV industry. In an effort to harmonize UV testing, the ETV DWS Center is coordinating with the ETV SWP to develop a single UV protocol that is very similar to AWWARF/NWRI Guidelines.

The ETV DWS Center provided comments to the EPA on their Preliminary Draft of the EPA's UV Guidance Manual (Attachment C) and is also proceeding with the following steps.

First, the Center will be asking the Steering Committee to ballot changes to the existing ETV DWS Center UV protocol to reflect the EPA QA comments. A ballot will be sent to the SC after this conference call.

Second, the Center will eventually ask the drinking water stakeholders to replace the existing ETV DWS Center UV protocol with the ETV SWP water re-use protocol with modifications applicable to drinking water applications. The rationale for this next step is

to harmonize UV protocols making them more consistent with each other and documents such as the NWRI Guidelines.

Third, the Center will encourage its stakeholders to comment on and provide guidance to the EPA's OGWDW UV Guidance Manual and encourage the EPA OGWDW to include in its guidance reference to the ETV Program and its protocols that are acceptable to the drinking water community.

The EPA's Office of Ground Water and Drinking Water provided the following update on schedule and process for LT2 rule to the ETV DWS Center stakeholders:

"In early 2001 EPA began developing a guidance manual for UV disinfection of drinking water. This guidance manual is intended to support the upcoming Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR). It will address the design and operation of UV systems and will contain a testing protocol for validating the operating conditions under which UV reactors can achieve different levels of disinfection performance. Last October EPA released a draft version of the UV guidance on a limited basis to solicit comment on a number of technical issues.

Comments were requested no later than December 17. EPA received comments on this draft from UV manufacturers, drinking water utilities and associations, consultants, and state governments. EPA is currently compiling these comments and will use them in developing the next draft of the manual. We plan to release a revised draft of the UV guidance manual for review and comment when the LT2ESWTR is proposed (currently expected in August 2002). If there is sufficient interest, it may be possible to release specific parts of the manual, such as the testing protocol, for further review prior to the rule proposal date.

In addition to guidance, regulatory criteria for UV disinfection of drinking water are expected to be included in the LT2ESWTR. These criteria may include required UV doses to achieve different levels of treatment credit, limitations on allowable downtime, and requirements for validating and monitoring UV reactors.

A pre-proposal draft of the LT2ESWTR rule was posted on EPA's web site on November 30 (<http://www.epa.gov/safewater/lt2/st2eswtr.html>) to solicit comment on the consistency of the draft with the Federal Advisory Committee Agreement in Principle for the LT2ESWTR and Stage 2 DBPR. Comments were requested no later than December 31, 2001. The next complete draft of the LT2ESWTR will be available for review and comment when the rule is proposed.

Question and comments on these efforts should be directed to Dan Schmelling at (202) 564-5281, or [schmelling.dan@epa.gov](mailto:schmelling.dan@epa.gov)."

### **1.3 Other Progress and Issues**

Changes in the field-testing organizations (FTOs) as proposed in June 2001 were implemented (see Stakeholder Meeting information packet, June 2001). This resulted in three fully qualified FTOs and six conditionally qualified FTOs. Please see the NSF DWS Center website for the most up-to-date status information.

Other Issues:

- Mandatory calculation of O&M efficiencies for technologies going through ETV testing
- Coagulation/Filtration technologies for Arsenic Removal: testing the water quality of water in reaction tanks and prior to media filters to verify the actual Iron coagulant feed concentration
- RO technologies for Arsenic Removal: The possible use of a As (III) spike to address limitations of the membranes

***Plans and Action Items:***

Highest priority to small system arsenic reduction technologies. The Center plans to do this by:

- Allocating its limited matching funds to arsenic treatment technologies as its first priority over other treatment technologies,
- Working with states to find communities and state agencies that will assist in offsetting arsenic testing by either in-kind contributions or grants,
- Joint testing with other organizations with funding such as the EPA's Technology Technical Assistance Centers.

Priority for harmonization of the ETV UV and Filtration Protocols with LT2 will be accomplished through close coordination with the EPA's OGWDW and an annual status report to OGWDW. In July 2001, the Center provided OGWDW with an update and will offer to do so again in 2002.

Electronic Communication:

The Center will communicate more by electronic means to the SC and its stakeholders to help with cost savings. This will include more web-based applications such as conferences on verified technologies and meetings, and CDs with all of the protocols, PSTPs, or all test reports that will be available at conferences or upon request.

The Center will also initiate a fee for requests of printed copies of final ETV documents that exceed those given to vendors upon issuance of a final report. This is necessary for NSF to conform to the Office of Management and Budget guidelines.

More cost sharing – a fee for services schedule (such as DWS Center report review costs) will be developed and implemented. The fee schedule will be designed as described in the Center's "White Paper" discussed at the June 2001 stakeholder meeting, to increase the quality of ETV verification testing.

## ATTACHMENT A

Vendor	Product	Technology	Mechanism and Contaminant of Concern	Status	Field Testing Organization/ Test Site
Aquasource N.A. . - Richmond, VA	Ultrafiltration System (Model A -35)	Ultrafiltration	Reduction of <i>Giardia</i> and <i>Cryptosporidium</i>	Testing and Reporting Completed May 2000	Gannett Fleming/ Pittsburgh, PA
Aquasource N.A. - Richmond, VA	Ultrafiltration System (Model A -35)	Ultrafiltration	Reduction of <i>Giardia</i> - and <i>Cryptosporidium</i> -sized particles	Testing and Reporting Completed September 2000	Montgomery Watson/ San Diego, CA
Atlantic UV Corporation	Megatron M250 UV Radiation System	Ultraviolet Radiation	Inactivation of MS2 bacteriophage	<i>Testing Completed – In Reporting Phase</i>	Montgomery Watson/ San Diego, CA
Calgon Carbon Corporation - Pittsburgh, PA	Sentinel™ Ultraviolet Reactor	Ultraviolet Radiation	Inactivation of <i>Cryptosporidium parvum</i>	Testing and Reporting Completed May 1999	Cartwright, Olsen and Assoc. (COA)/ Kitchener, Ontario, Canada
ClorTec, a Division of Capital Controls, Inc. - Campbell, CA	ClorTec On -Site Hypochlorite Generating System Model MC-100	Hypochlorite Generation	Production of Sodium Hypochlorite from Sodium Chloride brine solution	Testing and Reporting Completed September 2000	Gannett Fleming/ Hummelstown, PA
Exceltec International Corp., a Subsidiary of Severn Trent Services, Inc. - Sugar Land, TX	ClorTec On -Site Hypochlorite Generating System Model T-12	Hypochlorite Generation	Production of Sodium Hypochlorite solution and inactivation of <i>Pseudomonas aeruginosa</i>	Testing and Reporting Completed January 2001	ARCADIS Geraghty & Miller/ Lyman, SC
F.B. Leopold Company - Zelienople, PA	Ultrabar™ Ultrafiltration System	Ultrafiltration	Reduction of <i>Giardia</i> and <i>Cryptosporidium</i>	Testing and Reporting Completed July 2000	Gannett Fleming/ Pittsburgh, PA
Hydranautics - Oceanside, CA	Hydracap™ Ultrafiltration System with Mark III Membrane Element	Ultrafiltration	Reduction of MS2 Virus	Testing and Reporting Completed September 2000	Montgomery Watson/ San Diego, CA
Hydranautics - Oceanside, CA	ESPA2-4040 Reverse Osmosis Element Module	Reverse Osmosis	Reduction of Arsenic	Testing and Reporting Completed March 2001	COA/ Park City, UT
Ionics - Watertown, MA	Ultrafiltration System	Ultrafiltration	Reduction of <i>Giardia</i> - and <i>Cryptosporidium</i> -sized particles and MS2 Virus	Testing and Reporting Completed September 2000	Montgomery Watson/ San Diego, CA
Kinetico - Newbury, OH	Macrolite® Pressure Filtration Backwashable Depth System	Backwashable Depth Filtration	Reduction of <i>Giardia</i> and <i>Cryptosporidium</i>	Testing and Reporting Completed June 2001	COA/ Minneapolis, MN
Kinetico - Newbury, OH	Coagulation/ Filtration System	Coagulation/ Filtration	Reduction of <i>Giardia</i> and <i>Cryptosporidium</i>	Testing and Reporting Completed August 2001	COA/ Minneapolis, MN
Kinetico - Newbury, OH	Coagulation/ Filtration System	Coagulation/ Filtration	Reduction of Arsenic	Testing and Reporting Completed September 2001	COA/ Park City, UT
KOCH - Wilmington, MA	TFC-ULP4 Reverse Osmosis Element Module	Reverse Osmosis	Reduction of Arsenic	Testing and Reporting Completed August 2001	COA/ Park City, UT
Lapoint Industries (formerly U.F. Strainrite, Inc.) - Lewiston, ME	Aqua-Rite Potable Water Filtration System	Bag Filter	Reduction of turbidity and <i>Giardia</i> - and <i>Cryptosporidium</i> -sized particles	Testing and Reporting Completed September 2001	Gannett Fleming/ Burnside, PA



Vendor	Product	Technology	Mechanism and Contaminant of Concern	Status	Field Testing Organization/ Test Site
Osmonics - Minnetonka, MN	Ozone Disinfection System (Model PS-150)	Ozone	Inactivation of <i>Cryptosporidium</i> oocysts and Calculation of Ct	Testing and Reporting Completed December 2001	COA/ Minneapolis, MN
OXI Company, Inc. - Virginia Beach, VA	OXI-2B Onsite Mixed Oxidant Generator	On-Site Halogen Generation	Production of chlorine and Inactivation of <i>Pseudomonas aeruginosa</i>	Testing and Reporting Completed June 2001	ARCADIS Geraghty & Miller/ Lyman, SC
Pall Corporation - East Hills, NY	Microza™ WPM-1 Microfiltration System	Microfiltration	Reduction of <i>Giardia</i> and <i>Cryptosporidium</i>	Testing and Reporting Completed February 2000	Gannett Fleming/ Pittsburgh, PA
Pall Corporation - East Hills, NY	WPM-1 Microfiltration System	Microfiltration	Reduction of turbidity; iron and manganese precipitants; and <i>Cryptosporidium</i> , <i>E. coli</i> , and <i>bacillus</i> spores	Testing Completed – In Reporting Phase	Univ. of New Hampshire (UNH)/ Manchester, NH
PCI Membrane Systems - Milford, OH	Fyne Process Nanofiltration System Model ROP 1434	Nanofiltration	Reduction of total trihalomethanes and haloacetic acid	Testing and Reporting Completed September 2000	UNH and Univ. of Alaska (Anchorage)/ Barrow, AK
PentaPure, Inc. - West Saint Paul, MN	PentaPure® H-3000-I Mobile Water Purification Station	Modular treatment train with pentaiodide resin	Inactivation of <i>E. coli</i> and MS2 virus	Testing and Reporting Completed August 2001	ARCADIS Geraghty & Miller/ Lyman, SC
Rosedale Products Inc. - Ann Arbor, MI	Cartridge Filter	Cartridge Filter	Reduction of <i>Giardia</i> - and <i>Cryptosporidium</i> -sized particles	Testing and Reporting Completed September 2001	COA/ Minneapolis, MN
Separmatic Filter Company - Milwaukee, WI	Pressure DE Filter (Model 12P-2)	Diatomaceous Earth Filter	Reduction of turbidity, <i>Giardia</i> , <i>Cryptosporidium</i> , and MS2 virus	Testing Completed – In Reporting Phase	UNH/ Manchester, NH
Separmatic Filter Company - Milwaukee, WI	Vacuum DE Filter (Model VL-16)	Diatomaceous Earth Filter	Reduction of turbidity, <i>Giardia</i> , <i>Cryptosporidium</i> , and MS2 virus	Testing Completed – In Reporting Phase	UNH/ Manchester, NH
Trojan Technologies Inc. - London, Ontario	UVSwift Unit (Model 4L12)	Ultraviolet Radiation	Inactivation of MS2 bacteriophage	Testing Completed – In Reporting Phase	Montgomery Watson/ San Diego, CA
Watermark - Draper, UT	Coagulation/ Filtration System	Coagulation/ Filtration	Reduction of Arsenic	Testing and Reporting Completed March 2001	COA/ Park City, UT
Zenon - Burlington, Ontario	ZeeWeed™ Ultrafiltration System	Ultrafiltration	Reduction of <i>Giardia</i> and <i>Cryptosporidium</i>	Testing and Reporting Completed August 2000	Gannett Fleming/ Pittsburgh, PA
Zenon - Burlington, Ontario	ZeeWeed™ Enhanced Coagulation and Ultrafiltration System	Coagulation and Ultrafiltration	Reduction of turbidity; <i>Giardia</i> - and <i>Cryptosporidium</i> -sized particles; and MS2 virus	Testing and Reporting Completed August 2000	Montgomery Watson/ San Diego, CA
Zenon - Burlington, Ontario	ZeeWeed™ Ultrafiltration System	Ultrafiltration	Reduction of <i>Giardia</i> , <i>Cryptosporidium</i> , and MS2 virus	Testing and Reporting Completed June 2001	CH2M Hill/ Portland, OR

## ATTACHMENT B

### Microsphere Challenge Conference Call 10 am, September 12, 2001 Meeting Minutes

#### Participants

Steve Allgeier, U.S. EPA  
Jeff Adams, U.S. EPA  
Bruce Bartley, NSF International  
Joe Jacangelo, Montgomery Watson  
Angela Smith, NSF International  
Kristie Wilhelm, NSF International

CONFERENCE CALL BEGAN AT 10AM

Bruce Bartley began the conference call by explaining that this call was to determine the correct size range for microspheres to be used in testing as surrogates for *Cryptosporidium* removal. The basis for this discussion stemmed from a Field Testing Organization (FTO) unable to use live microorganisms at the site of the utility participating in the ETV testing.

Joe Jacangelo began by stating that using microspheres is a feasible way to determine removal and does not know why they shouldn't work. However, some questions need to be asked concerning the correct size range used, the distribution and confidence interval of those sizes, and the methods of detection and their corresponding minimum detection limits.

Steve then raised the question asking what the definition is between a good surrogate (removed about the same) and a conservative surrogate (a much smaller sized or harder to remove organism). For example, using MS2 for *Cryptosporidium* is a conservative surrogate. There is little data for side-by-side testing of *Cryptosporidium* and microspheres: some data with bag and cartridge, but none for membranes. No surrogates are identified in the rule language; however, the guidance language will mention surrogates. The absence of data leaves the door open to let states decide – guidance is needed. Bruce Bartley responded by recommending that a conservative surrogate be used in the ETV DWS Center for now so as not to hold up testing.

Steve and Joe agreed with using a conservative surrogate of maybe less than 3µm. Bruce asked if there was a certain size we should use (~2.5µm) or if another size should be considered. What are the pros and cons for conservative versus good surrogates?

Jeff asked if the surrogates are custom-made or bought off the shelf? Bruce explained that these would be custom-made surrogates and would have a minimal cost difference as compared to off the shelf versions.

Joe asked to consider size *distribution* before size consideration. A good estimate will be provided if a membrane removes the 5% of the microspheres less than the mean size. If 5% of the microspheres are larger than the mean size, then that will give a false estimate.

Bruce asked Kristie to discuss the Bag & Cartridge (B&C) systems, e.g. Rosedale, with respect to microsphere counts. Kristie explained that in one case, a microsphere manufacturer had provided microspheres with a mean of 3.4. When the size distribution was rerun, the mean was actually 2.98, which accounts for the poor performance. Another problem an FTO experienced had to do with particle counters also counting indigenous particles as well as the microspheres. This led to counting errors, i.e. counting less than the number of particles due to coincidence error. Fluorescent microspheres with microscopic analysis would be better. Bruce added that the ETV protocols could require particle free water for seeding studies and the use of microscopic enumeration.

Steve asked if one could pick a custom mean, standard deviation (SD), and confidence interval (CI) and Kristie answered yes, one could pick a mean. Bruce was relatively sure that one could pick the SD and CI. Therefore, if 2µm was used with 0.5 SD @ 99% CI, is this conservative? Joe and Steve replied by asking if we would know the

maximum and minimum. Kristie responded by saying that one would be given that information as well from the manufacturer.

Joe then asked if we could ask for a 99.9% CI with microspheres  $<2.5\text{ }\mu\text{m}$  and Steve replied that for B&C, one may have to specify both minimum and maximum numbers. Joe then asked if the microspheres are 99.9%  $<3\text{ }\mu\text{m}$ , what would the median be? Bruce said that the range would actually be 99.9%  $<2.5\text{ }\mu\text{m}$  with none larger than  $3\text{ }\mu\text{m}$ . Microscopic enumeration needs to be done on the effluent to compare with particle counters done on the effluent. Steve said that he knows of testing that was done where enumeration was used in the influent and particle counters were used on the effluent, but doesn't know the particulars of the test offhand.

Bruce asked what defines a good surrogate. San Diego has 6-8 technologies using UF and MF and the testing requires MS2-phage for *Cryptosporidium* and was wondering if there are other surrogates out there. Bruce also said that he would like to see side-by-side testing in California by Montgomery Watson (MW) with MS2, formalin-fixed *Cryptosporidium*, and microspheres. He then asked if 6-8 tests were enough studies to establish guidance. Steve replied that any data on this comparison would be helpful and would help get buy-in from primacy agencies. The guidance language would provide only guidance and not specify a specific size. Steve also brought up that there are other conservative surrogates (e.g. endospores, virus, bacteria). Microspheres can be sized, whereas other types are more specific.

Joe asked what results we are looking for and Bruce replied that we are looking for correlation studies for a size distribution of microspheres.

Joe then asked if we should look at removals with *Cryptosporidium* and microspheres or do we want partial removal of *Cryptosporidium* and removal of all microspheres? Side-by-side tests will tell more about the surrogates. Bruce would like ETV to provide funding to find a good surrogate and for protocol development. Bruce replied that NSF needs to talk with MW and asked if Aqua2000 would allow dead *Cryptosporidium*. Joe answered that he would need to check with the staff.

Bruce asked Jeff and Steve if it would be acceptable to draft a test plan (TP) and route to the EPA and they replied yes.

Joe explained that they would need to get a cost estimate. If it was part of a bench-scale study with AWWARF, maybe that MW and NSF could coordinate the testing. He recommended that a test be done with a compromised fiber. He also explained that other factors might influence removal, e.g. pH and hydraulics.

Bruce asked if the first step is doing a bench test. Joe responded that getting the microspheres is the first step and that bench scale may not be as embraced as pilot scale. Steve recommended doing bench scale to determine size and pilot scale to validate.

Bruce said that the pilot study might start in November. Bruce then said that he needs to talk with Samer Adham, of MW, and that NSF will begin researching obtaining the appropriate microspheres. He asked Joe to check with Aqua2000 about the use of *Cryptosporidium*.

Joe explained that the first step is to get the size and range of microspheres that we want, field test those, and then work on what a good surrogate is.

Bruce began outlining the Action Items by saying that NSF will call microsphere vendors to get:

- Cost/quantity
- Size (99.9%  $2.5\text{ }\mu\text{m}$ )
- Mean/size distribution
- Surface charge = 0

Joe asked about the surface charge of the microspheres and whether they should match the surface charge on *Cryptosporidium* so that they do not clump. Bruce responded by saying that in the Point-of Use (POU) and Point-of-Entry (POE) Programs, they request a certain charge so that the microspheres do not clump. However, *Cryptosporidium* has a surface charge and clumps with other particles. Steve added that other factors play a part in

particle rejection. Bruce recommended a neutral surface charge on the microspheres so that other variables won't be a factor.

Jeff wondered what the smallest unit is to purchase, in order to keep the cost down. Bruce responded that tests should be kept under 5gpm and would talk with Samer about this. Bruce explained that Green Bay will go with a conservative surrogate of microspheres.

Bruce added to the Action Items by saying that NSF will discuss with the FTO's:

1. the use of microspheres as surrogates for live microorganisms and the use of Microscopic Enumeration with Particle Counters for comparison. NSF to call microsphere manufacturers.
2. to provide a cost estimate to run side-by-side testing. Joe will ask if MW can use *Cryptosporidium* on-site at Aqua2000

NSF and MW will develop a TP and with cost estimates and the EPA will conduct a review.

CONFERENCE CALL ADJOURNED AT APPROXIMATELY 11:15AM

November 30, 2001

Mr. Daniel C. Schmelling  
U.S. Environmental Protection Agency  
MC 4607  
1200 Pennsylvania Ave. S.W.  
Washington, D.C. 20460

RE: Preliminary Draft of the EPA's Ultraviolet Disinfection Guidance Manual

Dear Mr. Schmelling,

The Environmental Technology Verification (ETV) Drinking Water Systems (DWS) Center received a copy of the preliminary EPA UV Disinfection Guidance Manual including the Appendix B: UV Disinfection System Validation Protocol (Preliminary Draft of the EPA's UV Guidance Manual) for review and comment. This letter is the initial review and comment on the Preliminary Draft of the EPA's UV Guidance Manual by the ETV DWS Center.

Although the EPA Office of Groundwater and Drinking Water (OGWDW) has stated they intend to allow the states to use other protocols, guidelines or standards for the validation of UV reactor performance, the language in the Preliminary Draft of the EPA's UV Guidance Manual does not clearly make this point. The UV validation protocol in Appendix B is referenced almost exclusively to other UV performance testing documents in the Preliminary Draft of the EPA's UV Guidance Manual. For example, there is no reference to any EPA ETV Protocol ("Protocol for Inactivation of Microbiological Contaminants: Test Plan for Ultraviolet Radiation Technologies" or "Draft – Generic Verification Protocol for Secondary Effluent and Water Reuse Disinfection Applications") and also no reference to the AWWA Research Foundation / National Water Research Institute (AWWARF/NWRI) "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse". The German Standard and testing center is mentioned throughout the document.

There are now several documents related to UV evaluation and testing for use in drinking water and each is unique and different from the other:

- The ETV Drinking Water Systems (DWS) Center "Protocol for Inactivation of Microbiological Contaminants: Test Plan for Ultraviolet Radiation Technologies".
- The ETV Source Water Protection (SWP) "Draft – Generic Verification Protocol for Secondary Effluent and Water Reuse Disinfection Applications".
- The AWWARF/NWRI "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse".
- The Appendix B in the Preliminary Draft of the EPA's UV Guidance Manual.

This proliferation of documents has created a considerable amount of consternation within the UV industry. In an effort to harmonize UV testing, the ETV DWS Center is coordinating with the ETV SWP to develop a single UV protocol that is very similar to AWWARF/NWRI Guidelines.

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Mr. Daniel C. Schmelling  
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If the existing EPA UV Disinfection Guidance Manual and Appendix B: UV Disinfection System Validation Protocol, remain unaltered as written, the practical result is the ETV DWS Center UV protocol will simply reference the final UV validation protocol in Appendix B of the EPA's UV Guidance Manual. Since the EPA UV Disinfection Guidance Manual may not be final for several years, the UV industry will likely not pursue verification testing until it is completed.

The second major comment has to do with the recommendation of third party oversight without mentioning the EPA's ETV Program and its DWS Center as an example of such an acceptable approach. This is especially important as you mentioned that states had said that an independent third-party oversight was important for their acceptance of UV validation. Since the states have made third party oversight important, at least the Preliminary Draft of the EPA's UV Guidance Manual should reference the EPA's own ETV Program as an example for independence and acceptance by the states.

As early as June 2001, we had agreed to work together on harmonizing the ETV UV protocols and the EPA's OGWDW UV Guidance Manual. You had said: "I appreciate your efforts in working with EPA to harmonize the ETV equipment performance validation protocols with those that we will develop under LT2. I have raised this issue with my management and we very much share your interest in making ETV and LT2 protocols consistent. The benefit of this to both programs is clear". I hope that the next version of the Draft of the EPA's UV Guidance Manual will better reflect your intention to work with the ETV DWS Center and to harmonize UV verification protocols.

Respectfully,

Bruce Bartley  
Manager, ETV DWS Center

cc: Jeff Adams, EPA Project Officer, ETV DWS Center, ORD  
Thomas Stevens, NSF Manager, ETV Source Water Protection  
Christine Cotton, Malcolm Pirnie, Inc.